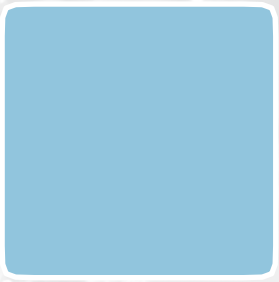
OCTOBER 2012



2012 Water Supply and Infrastructure Master Plan

Santa Clara Valley Water District

Santa Clara Valley Water District
2012
Water Supply and Infrastructure Master Plan

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October 2012

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Acknowledgments

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Water Supply and Infrastructure Master Plan Summary

A reliable supply of clean water is necessary for the social, economic, and environmental well-being of Santa Clara County. This is reflected in the Santa Clara Valley Water District (District) Act that states one of the purposes of the District is "to do any and every lawful act necessary to be done that sufficient water may be available for any present or future beneficial use or uses of the lands or inhabitants within the District." Furthermore, Board Policy states that "there is a reliable, clean water supply for current and future generations."

Additional water supply investments will be needed in the future to meet the county's water needs. The Water Supply and Infrastructure Master Plan (Water Master Plan) presents the Santa Clara Valley Water District's strategy for meeting those future needs. The activities and projects to carry out this strategy have to be funded or committed to by the District, and may be influenced by other factors beyond the scope of this Water Master Plan. However, the Water Master Plan does provide a water supply strategy for planning these activities and projects, and provides a roadmap for future District investments in water supply reliability.

The Water Master Plan is the District's strategy for providing a reliable and sustainable future water supply for Santa Clara County and ensuring new water supply investments are effective and efficient.

The District's Ensure Sustainability water supply strategy has three key elements: 1) secure existing supplies and facilities, 2) optimize the use of existing supplies and facilities, and 3) expand water use efficiency efforts. The District must secure existing supplies and facilities for future generations because they are, and will continue to be, the foundation of our water supply system. In addition, the District has opportunities to make more effective use of its existing assets. Finally, the District is committed to working with the community to meet Silicon Valley's future increases in water demand through conservation and recycling.

The Water Master Plan strategy is phased to ensure timely, appropriate investments decisions. Over the next five years, the District will continue work on securing and restoring existing supplies and infrastructure, and begin foundational work on developing future supplies. This foundational work includes participating in regional recycled water strategic planning, conducting public outreach on indirect potable reuse (IPR), identifying additional testing or demonstration activities that would be required to proceed with IPR, developing groundwater protection guidelines for gray water reuse, developing partnership agreements for dry-year water options, and participating in the development of regulations and policies. These activities are critical to successful project implementation, and once completed, the District can begin project-specific planning, design, and construction of new facilities.

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1 WATER MASTER PLAN 2012
A Reliable Water Supply is Important to the Community

A reliable supply of clean water is necessary for the environmental, economic, and social well-being of Santa Clara County. A safe and reliable water supply extends beyond the significant social requirements of basic health and sanitation. This extension includes economic vitality, environmental needs, agricultural requirements, social benefit, cultural expectations and requirements, and quality of life enhancements. On behalf of the community, the Santa Clara Valley Water District (District) has made significant investments to develop water supplies and infrastructure to meet the county's water needs. The Water Supply and Infrastructure Master Plan (Water Master Plan) identifies the District strategy to continue investments to meet the county's future water supply needs through at least 2035.

"Water is one of the Region's most precious resources, serving a multitude of needs… Sustainability in the long run requires that households, workplaces, and agricultural operations efficiently use and reuse water."
– Silicon Valley Index 2012

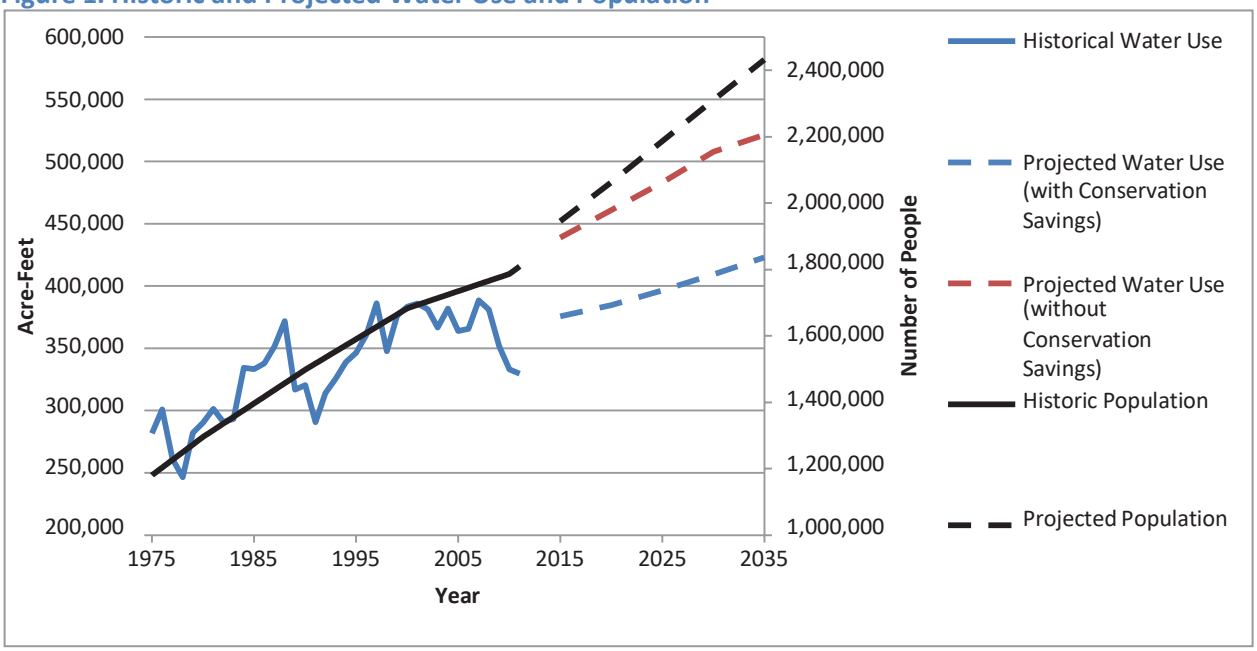
Santa Clara County Will Need More Water in the Future

The Association of Bay Area Governments (Association of Bay Area Governments, 2009) projects that the county's population will increase from about 1.8 million in 2010 to about 2.4 million by 2035. Jobs are projected to increase from about 0.9 million in 2010 to about 1.4 million in 2035. Even though per capita water use continues to decline, the District estimates that increases in population and jobs will result in increase in water demands from about 329,000 AF in 2010 to about 423,000 AF by 2035 (District, 2010).

Most of the increase in water demands will occur in northern Santa Clara County. In southern Santa Clara County, where about half of all water use is for agriculture, overall water demands will stay about the same through 2035. Urban water use is expected to increase, but agricultural water use is expected to decrease by a like amount.

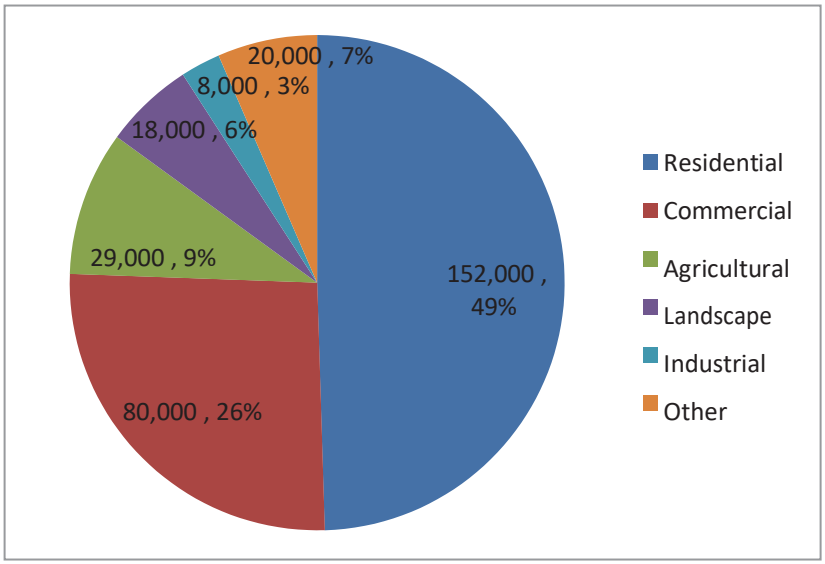
The District estimates that water demand would be higher, by about 51,000 AF in 2010 and 98,500 AF in 2035, if not for the community's efforts to conserve water. Water conservation reduces the need to make investments in new, more expensive capital facilities and is a critical element of meeting the community's future water needs. Figure 1 illustrates historic and projected water use and population. The drops in water use in Figure 1 are associated with the droughts of 1976 to 1977, 1987 to 1992, and 2007 to 2009.

Figure 1. Historic and Projected Water Use and Population[1]



The community uses water for a number of purposes, including residential, commercial, industrial, landscape irrigation, and agriculture. Figure 2 shows percentage of water use by these sectors. Residents, which need water for basic sanitation and to support their quality of life, account for about half the water used each year in the county. Nearly one-half of residential water use is outdoors. Commerce and industry need water for product manufacturing and delivery. Farmers need water to grow crops. Water shortages would have severe economic consequences. Water reductions of 10 to 30 percent, if imposed on commerce and industry, could result in a decrease in the local sales losses of $900 million to more than $10 billion, or about 7 percent of annual sales revenue (Sunding, 2010). In addition, shortages can lead to groundwater overdraft and land subsidence, which can damage infrastructure and increase flooding risks.

Figure 2. 2010 Water Use by Sector

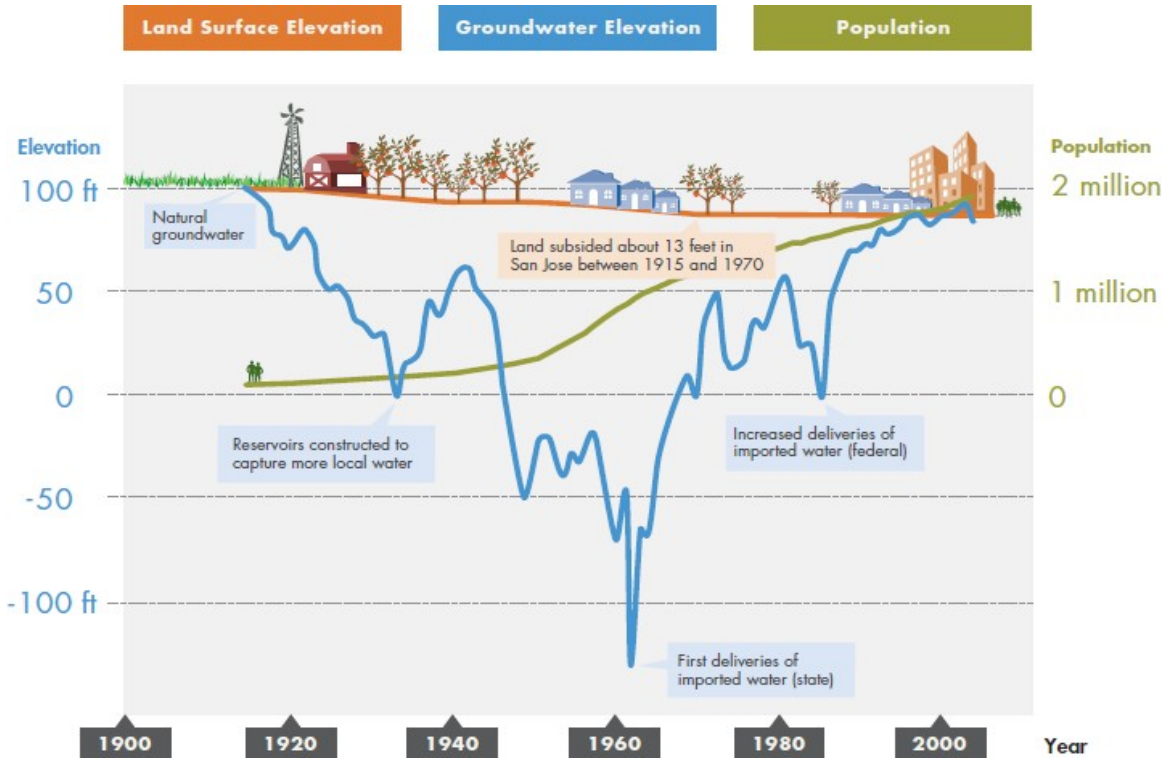


[1] Water use before 1988 is only for northern Santa Clara County.

The District Prior Investments in Water Supply Reliability

Voters approved the formation of the Santa Clara Valley Water Conservation District, a predecessor to today's water district, in 1929 to develop and manage water supplies to meet the county's needs. Northern Santa Clara County had experienced land subsidence from pumping more groundwater than could be replaced or replenished through rainfall. In response, the District constructed six reservoirs in the 1930s to store winter rains for groundwater recharge and summer irrigation use. Four additional reservoirs were constructed in the 1950s,[2] nearly tripling local storage to about 169,000 AF. Still, local supplies were insufficient to meet the county's growing population and subsidence continued. In 1965, the District began importing water from the State Water Project for groundwater recharge and use at drinking water treatment plants. The District began receiving water from the Federal Central Valley project in 1987. By the end of the 20th century, groundwater levels recovered and land subsidence was halted. The historic relationship between population growth, groundwater levels, subsidence, and water sources is illustrated in Figure 3.[3] As population and water use increases, the District will need to develop additional water supplies in order to meet the county's water needs and avoid land subsidence.

Figure 3. Relationship between Population Growth, Groundwater Levels, and Subsidence



[2] Two reservoirs were constructed by the Santa Clara Valley Water Conservation District and two reservoirs were constructed by the South Santa Clara Valley Water Conservation District which was annexed into the Santa Clara Valley Water District in 1987.

[3] Elevations are feet above or below mean sea level.

The District operates an integrated water supply system to meet demands in Santa Clara County. This consists of 10 dams, 17 miles of canals, four water supply diversion dams, 393 acres of recharge ponds, 91 miles of controlled in-stream recharge, 142 miles of pipelines, three drinking water treatment plants, and three pump stations. Local surface water and water imported from the Sacramento-San Joaquin River Delta (Delta):

- replenish the local groundwater subbasins, which are pumped for use by individual well owners and retail water suppliers,
- supply the District's drinking water treatment plants for purification,
- are delivered directly to agricultural water users, and
- help meet environmental needs.

The District manages groundwater supplies in conjunction with surface water supplies. In wet years, excess supplies are stored in the local groundwater basin or the Semitropic Groundwater Bank in Kern County for use in dry years. This helps the District manage the natural variations in rainfall and the associated variations in water supply availability.

Other agencies and organizations also contribute to water supply reliability in Santa Clara County. The San Francisco Public Utilities Commission delivers water to retailers in northern Santa Clara County. Stanford University and San Jose Water Company hold their own surface water rights. All four of the county's wastewater treatment plants produce recycled water for non-potable uses such as irrigation and cooling towers. The county's water supply, treatment, and distribution facilities are illustrated in Figure 4.

Background of the Water Supply and Infrastructure Master Plan

The District Act states that one of the purposes of the District is "to do any and every lawful act necessary to be done that sufficient water may be available for any present or future beneficial use or uses of the lands or inhabitants within the District." Furthermore, Board Policy states that "there is a reliable, clean water supply for current and future generations." One of the District's strategies for achieving this goal is to develop water supplies designed to meet at least 100 percent of average annual water demand identified in the District's Urban Water Management Plan during non-drought years and at least 90 percent of average annual water demand in drought years. The policies and strategy recognize that a reliable water supply is vital to the social, economic, and environmental well-being of the county.

> The District's mission is to provide for a healthy, safe, and enhanced quality of living in Santa Clara County through watershed stewardship and comprehensive management of water resources in a practical, cost-effective, and environmentally-sensitive manner for current and future

The analysis for the2012 Water Master Plan found that the county's water supplies are insufficient to meet future water needs,

primarily during droughts. Reserves would be depleted during extended droughts and short-term water use reductions of up to almost 30 percent (or about 119,000 AFY) would be needed to avoid land subsidence. The District has to make investments to fill this need. The District also needs to continue to make investments to maintain, restore, and replace its existing assets, some of which were constructed 75 years ago. The Water Master Plan provides a strategy for investments in new water supply projects and programs that builds on the District's existing assets and avoids making investments that are unnecessary or premature.

The Water Master Plan provides a strategy for investments in new water supply projects that builds on the District's existing assets and helps ensure timely, appropriate investment decisions.

Contents and Use of this Report

The Water Master Plan is organized as follows:

- Chapter 1 - The Importance of Water Supply Reliability, which discusses the community's water use and needs, the District's role in meeting those needs, and the background for the Water Master Plan.
- Chapter 2 - Challenges to Water Supply Reliability, which identifies the primary challenge of providing a reliable future water supply in Santa Clara County, and other risks to future water supply reliability.
- Chapter 3 – The Water Supply Strategy, which presents the District's strategy for meeting the county's future water supply needs.
- Chapter 4 – Next Steps, which describes how the water supply strategy will be implemented over time.

The references section of the report lists the documents that provided the basis for the 2012 Water Master Plan. The documents include the 2012 Water Supply and Infrastructure Master Plan Technical Report (Santa Clara Valley Water District, 2012), which documents the work done to develop the 2012 Water Master Plan. The Technical Report details the approach to developing the Water Master Plan, the data gathered during Water Master Plan development, the analyses performed, conclusions, and recommendations.

The Water Master Plan supports District Board of Directors decisions needed to ensure a reliable supply of safe, clean water for Santa Clara County. The water supply strategy provides a framework for investment decisions needed to secure existing water supplies and infrastructure and to meet future needs. The implementation schedule identifies the timing of key actions that are critical to the success of the strategy.

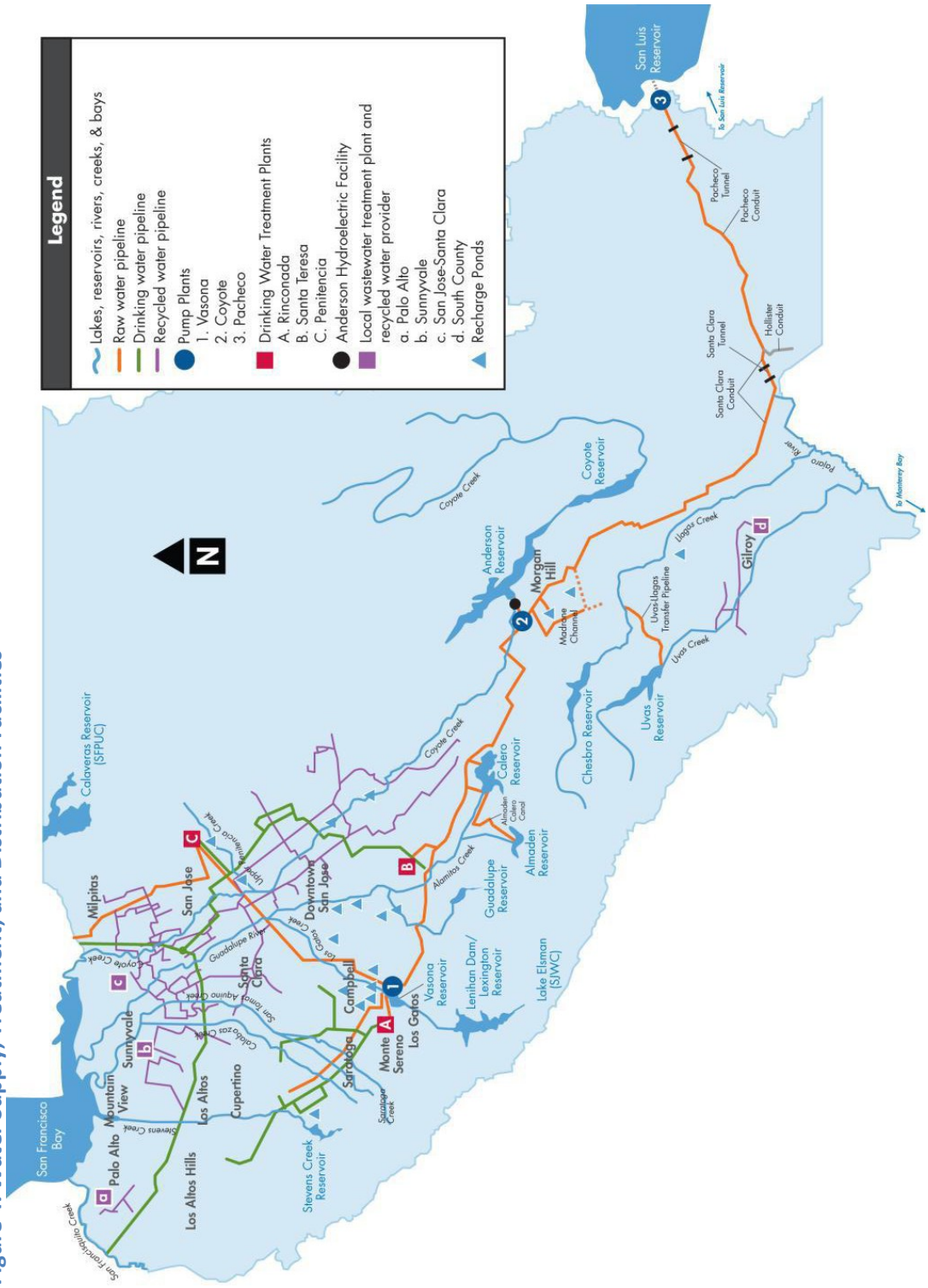


Figure 4. Water Supply, Treatment, and Distribution Facilities

The District Needs to Develop Suppplies for Future Droughts

This chapter describes the water supply reliability outlook for Santa Clara County. The Water Master Plan evaluates the ability to meet projected water demands through Year 2035 with the baseline water supply system. The evaluation shows existing supplies are sufficient to meet most future demands in normal years, but will not meet needs in future droughts. In addition, several risks could affect future water supply reliability. Risks such as climate change, changes to regulations, and new policies could affect local and imported supply availability. The District's strategy is to develop supplies that will meet future drought year needs and address multiple risks.

Baseline Water Supplies are Sufficient to Meet Most Future Demands

The baseline water supply system consists of existing water supplies and infrastructure, including several improvements. The Water Master Plan assumes the District will improve existing dams to remove operating restrictions, expand Rinconada Water Treatment Plant capacity to 100 MGD, repair Main and Madrone Pipelines, increase non-potable recycled water use to about 30,000 AFY in 2035, and increase water conservation savings to about 99,000 AFY by 2030. The baseline water supply system will be sufficient to meet most average demands through 2035. Figure 5 and Table 1 show anticipated average water supplies from the baseline water supply system through year 2035. Until 2035, supplies exceed demands. In 2035, there is an estimated shortfall of about 2,000 acre-feet per year (AFY) between supplies and demands.

Baseline Water Supply System

- Existing natural groundwater recharge
- Existing local surface water supplies
- Recycled water use increasing from about 15,000 AFY in 2010 to about 30,000 AFY in 2035
- Existing imported water supplies
- Conservation savings increasing from about 51,000 AFY in 2010 to about 99,000 AFY in 2035
- Dam seismic retrofits and other improvements to remove operating restrictions
- Rinconada Water Treatment Plant capacity of 100 million gallons per day
- Main and Madrone Pipeline repairs

Figure 5. Average Water Supplies Through 2035

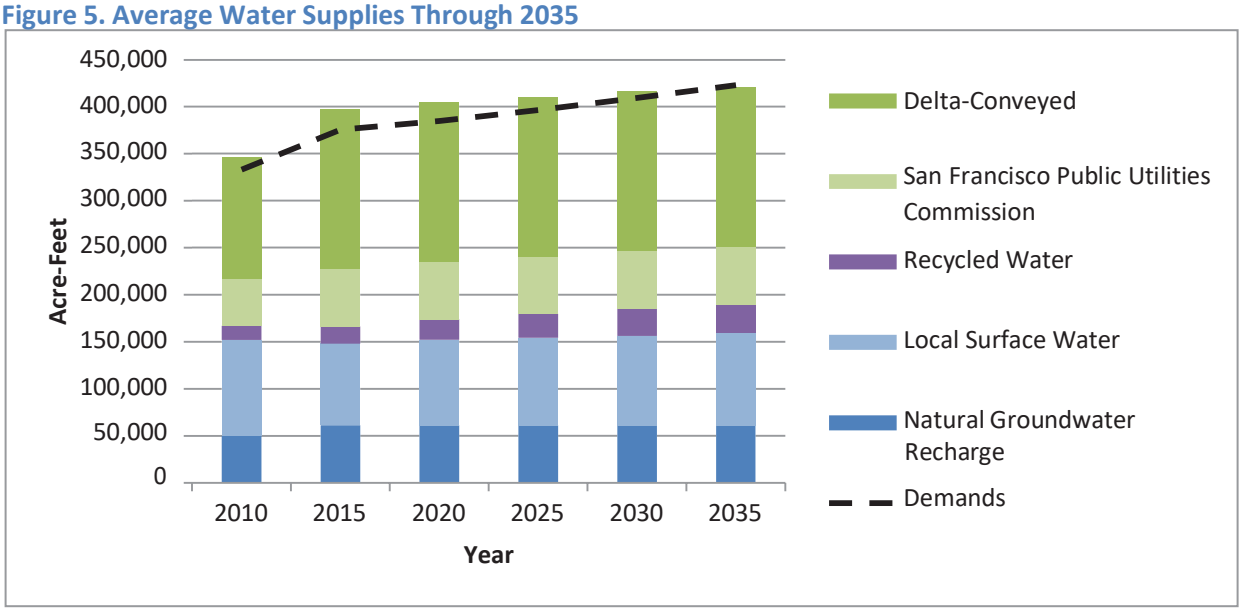


Table 1. Average Water Supplies Through 2035

Source of Supply (Acre-Feet)	2010 (Actual)	2015	2020	2025	2030	2035
Natural Groundwater Recharge	50,000	61,000	61,000	61,000	61,000	61,000
Local Surface Water	102,000	87,000	91,000	93,000	95,000	98,000
Recycled Water	15,000	18,000	22,000	26,000	29,000	30,000
SFPUC	50,000	62,000	61,000	61,000	61,000	62,000
Delta-Conveyed	129,000	170,000	170,000	170,000	170,000	170,000
Total Supply (Acre-Feet)	346,000	398,000	405,000	410,000	417,000	421,000
Total Demand (Acre-Feet)	333,000	376,000	385,000	396,000	409,000	423,000

Local Water Supply Sources

The groundwater subbasins are naturally recharged with rainfall, seepage from surrounding hills, seepage into and out of the groundwater subbasin, leakage from pipelines, and irrigation return flows. Natural groundwater recharge varies based on rainfall and groundwater levels. On average, natural groundwater recharge provides about 61,000 AFY of supply.

Local reservoirs and streams capture rainfall and run-off. This water is used for recharge, irrigation, or drinking water treatment. On average, the District's local surface water supplies will provide about 87,000 AFY in 2035.[4] On average, San Jose Water Company and Stanford University local surface water supplies provide additional supplies of about 11,000 AFY.

[4] Currently, District surface water supplies are constrained to an average of about 76,000 AFY by operating restrictions on local reservoirs for seismic safety. These supplies are anticipated to be restored by 2025.

Recycled water is a local source that is not dependent on rainfall. Recycled water is produced by the county's four publicly-owned wastewater treatment plants. It is municipal wastewater that has been treated to levels that make it appropriate for various non-drinking water (non-potable) purposes. Non-potable recycled water use is projected to increase from about 15,000 AF in 2010 to 30,000 AF in 2035.

Imported Water Supply Sources

Imported supplies are used to meet a large percentage of county water needs–about 55 percent on average. Imported water conveyed though the Delta via the State Water Project (SWP) and Central Valley Project (CVP) is used to supply District drinking water treatment plants, groundwater recharge facilities, and irrigators. On average, more than 70 percent of Delta-conveyed supply is delivered to treatment plants, almost 30 percent is used for recharge, and a small percentage is delivered to irrigators. In addition, when available, the District stores excess Delta-conveyed supplies in the Semitropic Groundwater Bank and San Luis Reservoir in the Central Valley, and locally in Anderson and Calero Reservoirs. The District has a contract for 100,000 AFY of SWP water and 152,500 AFY of CVP water. However, the actual amount of water allocated under these contracts each year is typically less than these contractual amounts and depends on hydrology and regulatory restrictions. The average allocation of Delta-conveyed water is about 170,000 AFY and is not expected to change between now and 2035.

Santa Clara County began using San Francisco Public Utilities Commission (SFPUC) Hetch-Hetchy system water to supplement local supplies in 1952. This water is provided to north county cities with access to Hetch-Hetchy pipelines. On average, the SFPUC delivers about 61,000 AFY to Santa Clara County, which is not expected to change between now and 2035.

Supply Variability and Hydrology

Santa Clara County, like the rest of California, experiences drastic changes in year-to-year annual precipitation. The variation in precipitation, both locally and in the Sierra Nevada Mountains, results in fluctuations in the amount of water supply available from year to year. In many years, annual supplies exceed demands, while in some years demands can greatly exceed supplies. Figure 6 and Table 2 illustrate county water supplies under different hydrologic conditions compared to projected water demands in 2035.[5] The supplies shown do not include the use of reserves, which will lessen any shortfalls.

[5] The extended drought supplies are the average over a six-year drought period. Some years are less dry than others, so the average is higher than in a single critical dry year. Also, natural groundwater recharge is higher than average in a critical dry year due to increased seepage into the groundwater subbasins as groundwater levels decline.

Figure 6. Water Supplies under Different Hydrologic Conditions

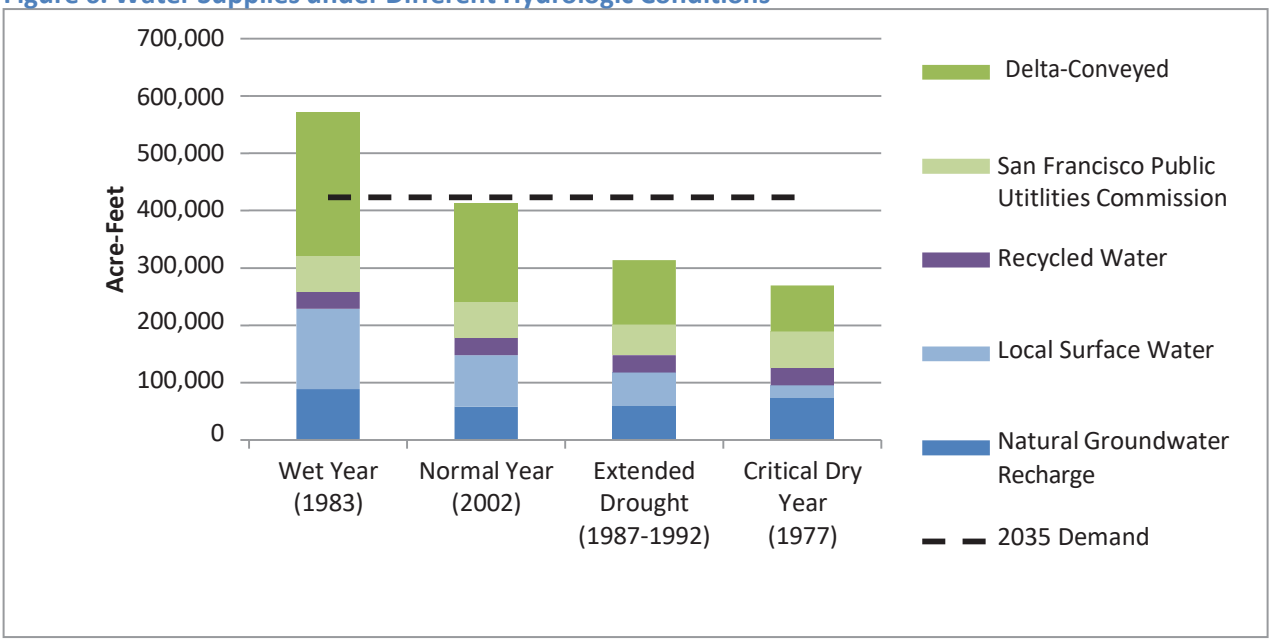


Table 2. Water Supplies under Different Hydrologic Conditions

Source of Supply (Acre-Feet)	Wet Year (1983)	Normal Year (2002)	Extended Drought (1987–1992)	Critical Dry Year (1977)
Natural Groundwater Recharge	89,000	58,000	59,000	74,000
Local Surface Water	140,000	90,000	58,000	22,000
Recycled Water	30,000	30,000	30,000	30,000
SFPUC	63,000	63,000	54,000	63,000
Delta-Conveyed	249,000	172,000	112,000	80,000
Total Supply (Acre-Feet)	**571,000**	**413,000**	**313,000**	**269,000**
Surplus or (Shortfall) (Acre-Feet)	**148,000**	**(10,000)**	**(110,000)**	**(154,000)**

The District's basic water supply strategy to compensate for this supply variability is to store excess wet year supplies in the groundwater basin, local reservoirs, San Luis Reservoir, or Semitropic Groundwater Bank. The District draws on these reserve supplies during dry years to help meet demands. These reserves are sufficient to meet demands during a critical dry year and the first several years of an extended drought.

Future Droughts are the Primary Water Supply Challenge

Water supply reserves are insufficient to meet needs throughout an extended drought. Due to growing demand, water supply shortages during droughts begin to appear in 2015 and increase in magnitude and frequency over time. By 2035, without new supplies or conservation savings, shortages could occur in about 11 percent of years, and supplies would only be able to meet about 70 percent of average demand during some years. Short-term water use reductions of up to almost 30 percent (or 119,000

AFY) would be needed to avoid shortages and minimize the risk of land subsidence. Figure 7 and Table 3 show the supplies and groundwater reserves that would be available in 2035 during a six-year drought like the one that occurred between 1987 and 1992.

Figure 7. 2035 Baseline Supplies and Reserves Available during an Extended Drought

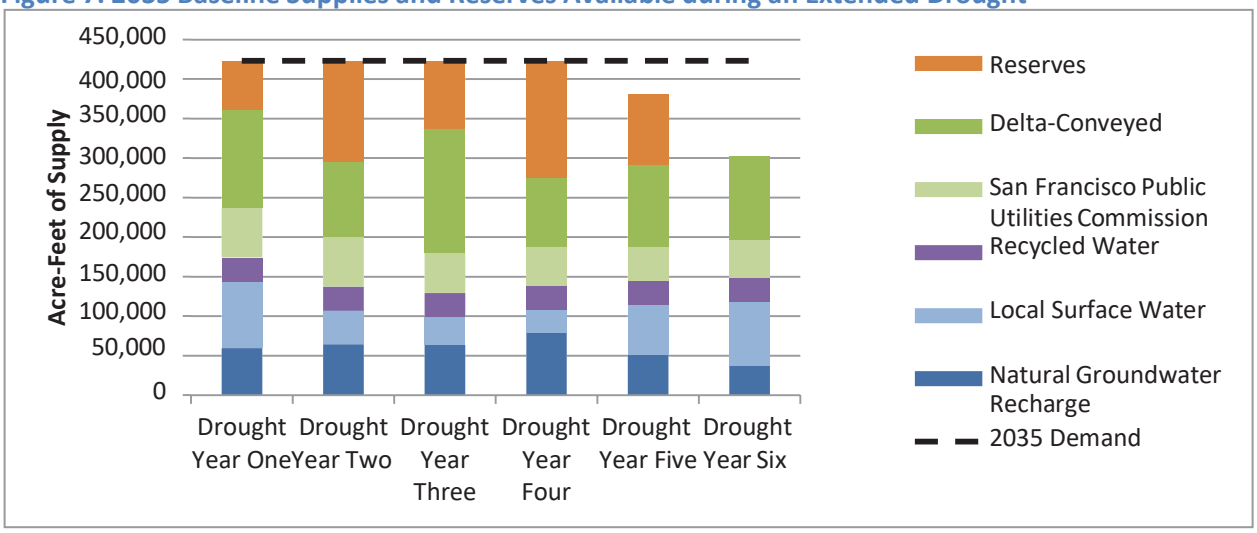


Table 3. 2035 Baseline Supplies and Reserves Available during an Extended Drought

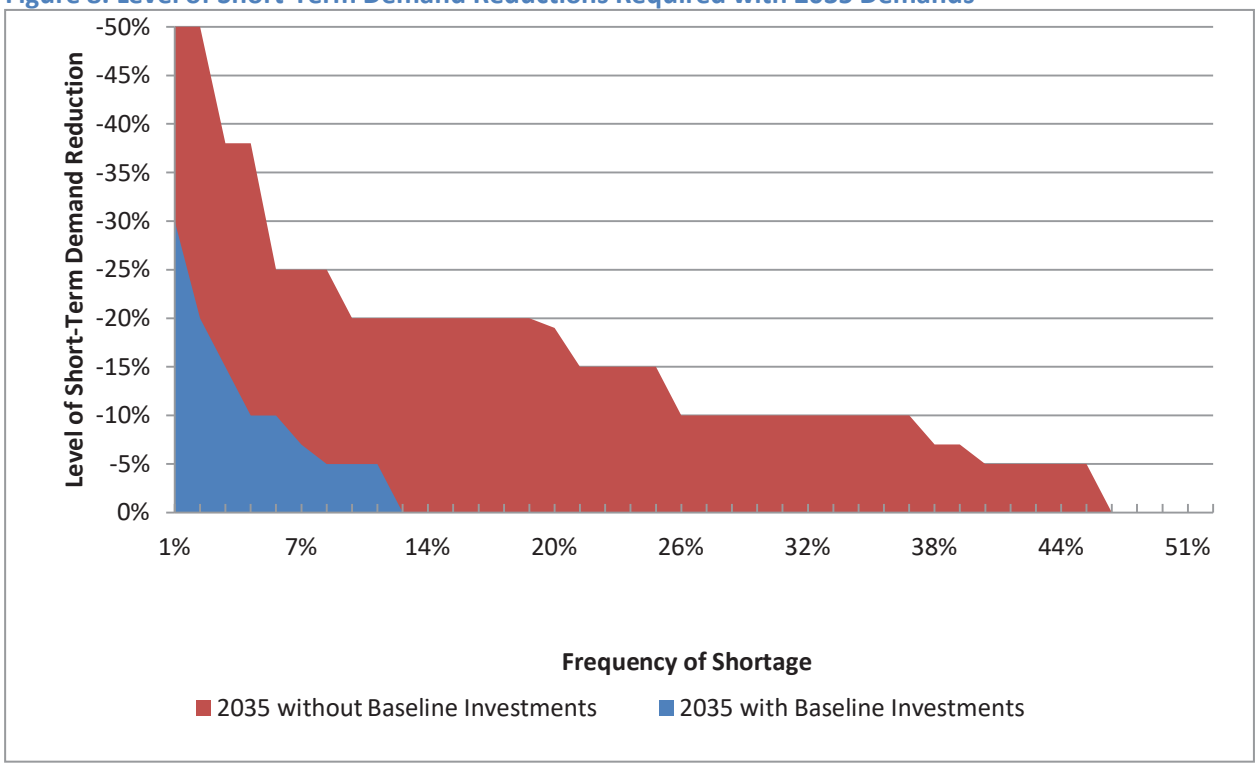
Source of Supply (Acre-Feet)	Drought Year One	Drought Year Two	Drought Year Three	Drought Year Four	Drought Year Five	Drought Year Six
Natural Groundwater Recharge	60,000	64,000	64,000	79,000	51,000	38,000
Local Surface Water	84,000	43,000	35,000	29,000	63,000	81,000
Recycled Water	30,000	30,000	30,000	30,000	30,000	30,000
SFPUC	63,000	63,000	51,000	51,000	44,000	49,000
Delta-Conveyed	125,000	95,000	157,000	87,000	103,000	106,000
Reserves	61,000	127,000	85,000	147,000	89,000	0
Shortfall (Acre-Feet)	0	0	0	0	43,000	119,000

A Secure Baseline and New Dry Year Supplies Are Needed to Meet Future Water Needs

First and foremost, the District will continue to depend upon its baseline water supply system to support future needs. Therefore, it is critical that the District make investments to secure the baseline water supply system. Without the baseline investments, the water supply outlook would be worse. Shortages would occur sooner and more frequently, and could be more severe, without the baseline water supply system investments.

Figure 8 illustrates the importance of baseline investments in water supply reliability. The figure presents water supply shortages, represented by level of demand reductions during droughts, under two scenarios. The first scenario (shown in blue) reflects the assumption that the baseline water supply system will be in place in 2035. The second scenario (shown in red) shows shortages that would occur if local reservoir operating capacity is not restored, recycled water use is not expanded, and conservation does not increase as planned. This second "no action" scenario does not take into account likely additional imported water reductions that would occur if investments are not made in restoring the Delta ecosystem and reliable Delta conveyance, in which case there is a risk that greater shortages could occur.

Figure 8. Level of Short-Term Demand Reductions Required with 2035 Demands



Risks Threaten Water Supply Reliability

The water supply outlook assumes existing water supplies are available in the future. However, there are risks that threaten the reliability of the existing water supplies. The water supply strategy needs to address the need for drought year supplies and perform well under multiple risks. The risks are summarized below.

Climate Change

Evidence of climate change is already being observed in California. In the last century, the California coast has seen a sea level rise of seven inches, the average April 1 snow-pack in the Sierra Nevada region has decreased in the last half century, and wildfires are becoming more frequent, longer, and more wide-spread (U.S Environmental Protection Agency, 2011). Temperature projections for the Bay Area show a shift in the timing of spring and summer heat extremes (Ekstrom, 2012), as well as an increase in the frequency and intensity of heat waves (Cayan, 2012). These temperature changes could result in changes in water demands. Predictions for the Southwestern US and California generally indicate that reduced quantity of surface water from local runoff is likely. Climate models suggest a drying tendency and a decline in the frequency of precipitation events, but not a clear-cut change in the intensity of precipitation events. Historic precipitation data for California's central coast region shows a trend toward decreasing rainfall during the November to January period and a trend toward increasing rainfall during the February to April period.

Climate change is a global phenomenon; though it is manifested differently in different regions.

The District's vulnerabilities to climate change include increases in seasonal irrigation demands, a decrease in imported water supplies as a result of reduced snow pack and a shift in the timing of runoff, a decrease in local surface water supplies as result of reduced precipitation and shifts in the timing of runoff, more frequent and severe droughts, changes in surface water quality associated with changes in flows and temperature, and changes in imported water quality due to salinity intrusion in the Delta.

Potential effects of climate change on Delta-conveyed imported water supply availability have been incorporated into the water supply projections in the Water Master Plan because they have been developed for the watersheds that provide the supplies (California Department of Water Resources, 2009). However, potential climate change effects on local supplies and demands have not yet been incorporated into the Water Master Plan, because the analysis to support such forecasts have not yet been completed. The District needs to be proactive in compiling and analyzing data that could provide insights into potential local changes in runoff, water quality, and demands. The District also needs to implement a water supply strategy that will adapt well to future climate change by managing demands, providing drought-proof supplies, and increasing system flexibility in managing supplies.

Reductions in Imported Water Supplies

In the last 15 years, major changes have been made to state and federal water project operations as a result of regulations to protect Delta water quality and help recovery of endangered and threatened fish species. These regulations reduce Delta exports at certain times of the year and there is the possibility of more stringent requirements in the future. To address this risk, the District is participating in development of the Bay Delta Conservation Plan to achieve co-equal goals of water supply reliability and ecosystem restoration for the Delta.

The California Aqueduct delivers Delta-conveyed supplies to customers municipal, industrial, and agricultural customers

The District's CVP municipal and industrial (M&I) water supplies are provided pursuant to an interim administrative policy that gives priority to CVP M&I water service over CVP agricultural water service. The United States Bureau of Reclamation (Reclamation) is in the process of finalizing this policy. To mitigate the impacts and provide support for the policy, the District entered into a supplemental agreement with agricultural districts in the San Luis and Delta-Mendota Water Authority and Reclamation. If Reclamation's final M&I policy substantially changes or the supplemental agreement is not maintained, there is a risk that the District's CVP supplies could be reduced by as much as 40,000 AFY in the future.

The quantity of SFPUC supplies used in the county could be reduced in the future. This could result from retailers' shift of their use as SFPUC supplies become more expensive than District groundwater, or from an SFPUC supply interruption to the cities of San Jose and Santa Clara, which have temporary and interruptible contracts with SFPUC. SFPUC will supply a combined annual average of about 10,000 AFY to the cities of San José and Santa Clara through 2018, subject to interruption or reduction. By December 31, 2018, SFPUC will make further decisions regarding long-term water supplies through 2030. The District will support local water retailer efforts to secure long-term water supplies.

Revenue Requirements

For the decades ahead, the highest priority work of the District's Water Utility Enterprise is to implement a program of activities to ensure that water supplies are diversified and reliable to meet current and future demands and that treated water quality standards are met. This program of operations, maintenance, and capital improvement activities that support direct and in-lieu groundwater recharge will require increased funding from groundwater production charges and other sources of revenue.

The District continues to monitor those risks that can change the water supply outlook and works to influence key external decisions that have the potential to impact water supply reliability. The Water Master Plan will be reviewed annually and updated at least every five year. This planning cycle allows risks to be evaluated on an ongoing basis, so that the water supply strategy can be updated as better information becomes available.

Provided the baseline system remains intact, existing water supply sources are sufficient to meet the county's water future supply needs in normal years and a single dry year.

Additional water supplies are needed to meet demands during extended droughts. Drought year shortfalls could occur as early as 2015 and will become severe by 2035. An extended drought in 2035 could result in the need short-term water use reductions of up to almost 30 percent (or about 119,000 AFY).

The Water Supply Strategy Ensures Sustainability

To provide a reliable supply of water to meet needs through 2035 the District's Ensure Sustainability water supply strategy relies on the following three elements:

1. secure baseline supplies and infrastructure,
2. optimize the use of existing supplies and infrastructure, and
3. increase recycling and water conservation to meet future increases in demands.

This strategy ensures sustainability because it meets future increases in demands with conservation and recycling, builds on the existing baseline system, and manages risks to water supply reliability from climate changes and reduced imported water supplies. The strategy is also consistent with District policies and stakeholder interests.

The Elements of the Ensure Sustainability Water Supply Strategy Work Together

The three elements of the Ensure Sustainability water supply strategy work together. The baseline water supply system will continue to support most of the county's future water needs. Optimizing the use of existing supplies and infrastructure leverages the investments the District has already made in water supply reliability and increases the system's flexibility. Additional recycling and conservation will bridge the gap between existing system capability and future demands, as well as manage risks from climate change and imported water reductions. Each of the water supply strategy elements is discussed below.

1. Secure Baseline Water Supplies and Infrastructure

The baseline water supply system is the most critical element of the water supply strategy, because it will provide the most water supplies and is the foundation of future water supply investments. The baseline water supply system is comprised of the existing and already planned water supplies and infrastructure. The Water Master Plan is built on the assumption that baseline system will be available through the planning horizon of 2035. Baseline water supplies are expected to increase from the current average of about

Baseline Water Supply System

- Existing natural groundwater recharge
- Existing local surface water supplies
- Recycled water use increasing from about 15,000 AFY in 2010 to about 30,000 AFY in 2035
- Existing imported water supplies
- Conservation savings increasing from about 51,000 AFY in 2010 to about 99,000 AFY in 2035
- Dam seismic retrofits and other improvements to remove operating restrictions
- Rinconada Water Treatment Plant capacity of 100 million gallons per day
- Main and Madrone Pipeline repairs

398,000 AFY to an average of 421,000 AFY in 2035. The increase in baseline supplies is due to removal of operating restrictions on existing reservoirs and increased non-potable water recycling. Baseline conservation savings are projected to increase from about 53,000 acre-feet (AF) in 2011 to about 99,000 AFY by 2030. These savings reduce demands on the water supply system and the need for more capital-intensive improvements. Ensuring adequate investment in the existing system is critical to reliability, because without the baseline system future water supply shortages could be severe.

2. Optimize the use of Existing Supplies and Infrastructure

Groundwater Recharge

To fully utilize additional supplies that could be developed under the Ensure Sustainability strategy, new groundwater recharge ponds will increase the District's groundwater recharge capacity. The yield from the new ponds is about 3,300 AFY on average. The recharge ponds could be located on the west side of the valley, along Saratoga Creek near Highway 85. Additional groundwater recharge ponds provide additional capacity to process wet-weather flows and help maintain groundwater levels, both of which help manage risks due to climate change and supply interruptions. The estimated present value cost of new groundwater recharge ponds is about $14 million.

Reservoir Pipeline

Pipelines transport water and add flexibility to water supply system operations.

A connection between Lexington Reservoir and the raw water system will provide greater flexibility in using existing local water supplies. Use of recycled water for recharge, as described below under Indirect Potable Reuse, will allow surface water from Lexington Reservoir to be put to beneficial use elsewhere in the county. In addition, the pipeline will enable the District to capture some wet-weather flows that would otherwise flow to the Bay. The pipeline is expected to provide an average annual yield of 1,500 acre-feet. The estimated present value cost of the reservoir pipeline is about $10 million.

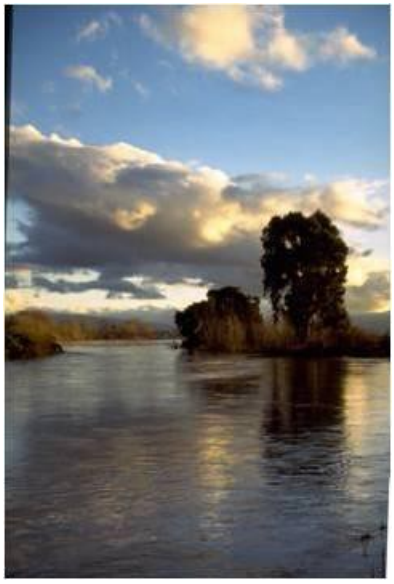
Imported Water Reoperations

The District would reoperate the Semitropic Groundwater Bank when it is nearly full and the District water supply needs are otherwise met to sell or exchange up to 50,000 AFY of stored water. This would create additional space in the Semitropic Groundwater Bank for carryover of supplies during wetter years, maximize the value of the District's existing assets (imported water contracts and investment in the Semitropic Groundwater Bank), and potentially help fund investments in infrastructure and additional local supplies. The estimated present value benefit of imported water operations is about $74 million.

3. Increase Recycling and Conservation

Indirect Potable Reuse

Indirect potable reuse is a high-quality, local drought-proof supply that is resistant to climate change impacts and most other risks identified in Chapter 2. It will provide a new local supply for recharge, which will help maintain reservoir supplies that are used to meet flow and temperature requirements for fish in local creeks. Indirect potable reuse would also reduce discharges to South San Francisco Bay from the wastewater treatment plants. Using advanced treated recycled water for recharge also provides groundwater quality benefits, in that advanced treatment removes nearly all the salts from the water that is used for recharge, resulting in high quality water being recharged into the groundwater basin.



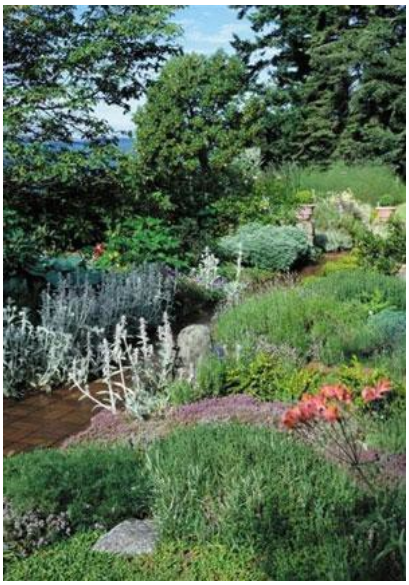
Indirect potable reuse includes delivering advance treated recycled water to groundwater recharge ponds

The Ensure Sustainability strategy relies upon development of indirect potable reuse to provide most of the new water supply to meet future water needs. The Water Master Plan assumes that at least 20,000 AFY of advanced treated recycled water will be available for groundwater recharge by 2030. A number of potential projects are being identified, and future development will be influenced by strategic planning currently underway in partnership with South Bay Water Recycling and others. For purpose of this Water Master Plan analysis, a project was assumed to use water treated at the existing San Jose/Santa Clara Water Pollution Control Plant and pumped to existing recharge ponds in the Los Gatos Recharge System.

One challenge to indirect potable reuse project will be overcoming some people's concerns about the quality of advanced treated recycled water. New regulations could also affect the benefits of indirect potable reuse. When State regulations move toward permitting direct potable reuse (putting advanced treated recycled water directly into pipelines that supply drinking water treatment plants), the District may want to consider that option as it adds flexibility, reduces costs, and potentially reduces energy use. The water supply strategy is to support indirect potable reuse by 1) conducting technical studies, 2) increasing public awareness, 3) monitoring regulatory development, and 4) participating in and conducting regional recycled water master planning. The estimated present value cost of indirect potable reuse is about $339 million.

Gray Water Reuse Rebate Program

The gray water reuse rebate program will provide financial incentives to customers who install reuse systems. This would result in about 300 AFY in water savings, at a relatively low cost. The program could be expanded to increase water savings, depending upon resolution of public agency concerns about water quality and public health issues. The estimated present value cost of a gray water reuse rebate program is about $3 million.



Gray water reuse provides a sustainable supply of water for irrigation

Water Supply Reliability Improvements Meet Level of Service Goals

The District Board approved a long-term water supply reliability level of service goal on June 12, 2012. The goal is to develop supplies to meet at least 100 percent of average annual water demand identified in the District's Urban Water Management Plan during non-drought years and at least 90 percent of average annual water demand in drought years. This level of service is consistent with recommendations from the Stakeholder Review Committee. Figure 9 and Table 4 show water supply availability during an extended drought like the one that occurred from 1987 to 1992 with the Ensure Sustainability water supply strategy in place and the 2035 demand level.

Figure 9. Proposed Water Supplies during an Extended Drought with 2035 Demands

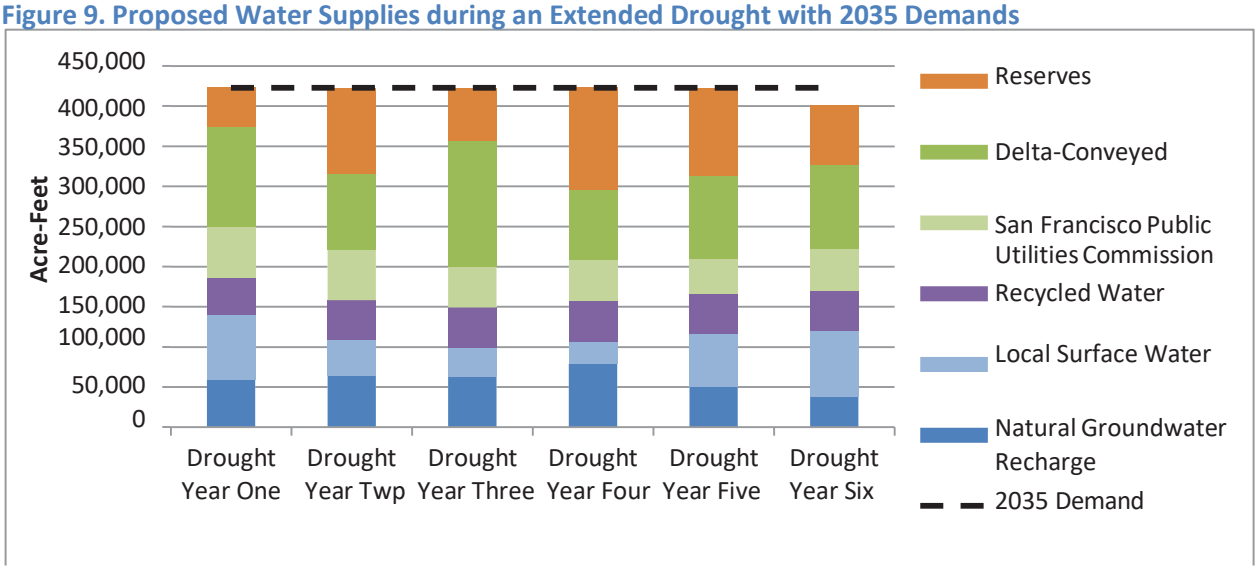
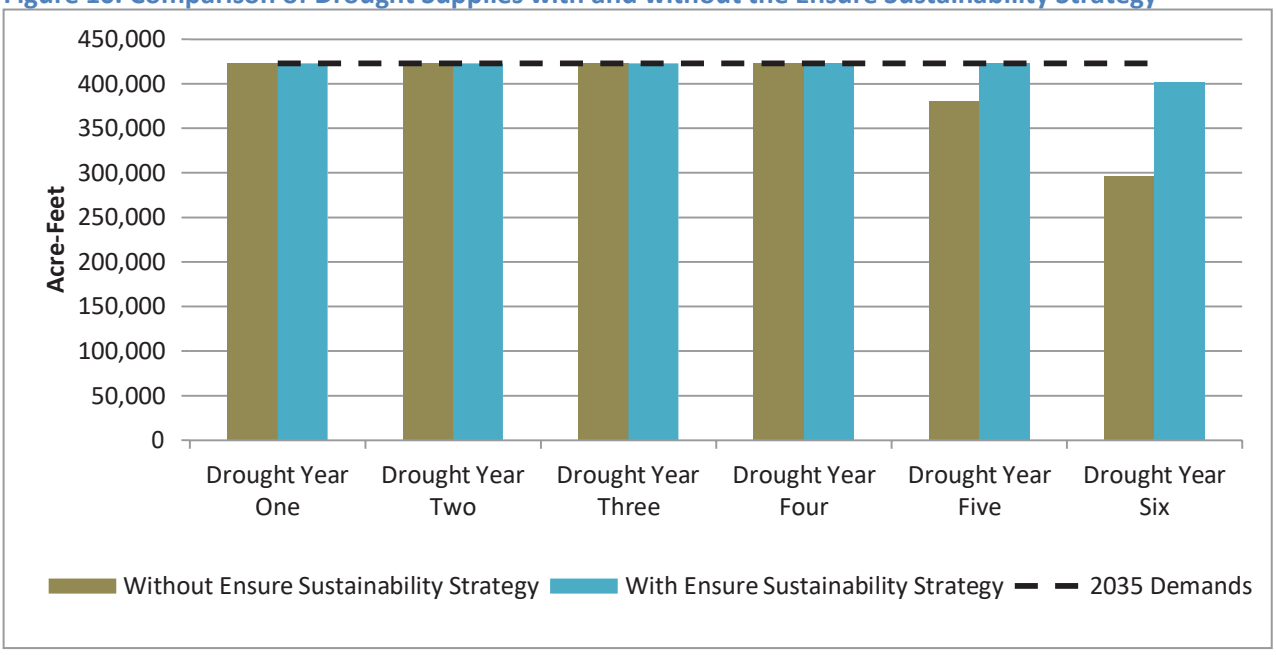


Table 4. Proposed Supplies during and Extended Drought and 2035 Demands

Source of Supply (Acre-Feet)	Drought Year One	Drought Year Two	Drought Year Three	Drought Year Four	Drought Year Five	Drought Year Six
Natural Groundwater Recharge	60,000	64,000	64,000	79,000	51,000	38,000
Local Surface Water	80,000	43,000	35,000	28,000	64,000	83,000
Recycled Water	47,000	50,000	50,000	50,000	50,000	50,000
SFPUC	63,000	63,000	51,000	51,000	44,000	49,000
Delta-Conveyed	125,000	95,000	157,000	87,000	103,000	106,000
Reserves	49,000	106,000	66,000	128,000	110,000	75,000
Shortfall (Acre-Feet)	0	0	0	0	0	22,000

With the Ensure Sustainability Strategy in place, supplies are sufficient to meet 100 percent of demand during the first five years of drought and more than 90 percent of demands during the sixth year of an extended drought. This is consistent with the supply reliability level of service goal. Further, this is an improvement over the baseline projection, where existing supplies could only meet about 70 percent of demands during the sixth year of extended drought. Figure 10 compares baseline water supplies to proposed water supplies during an extended drought.

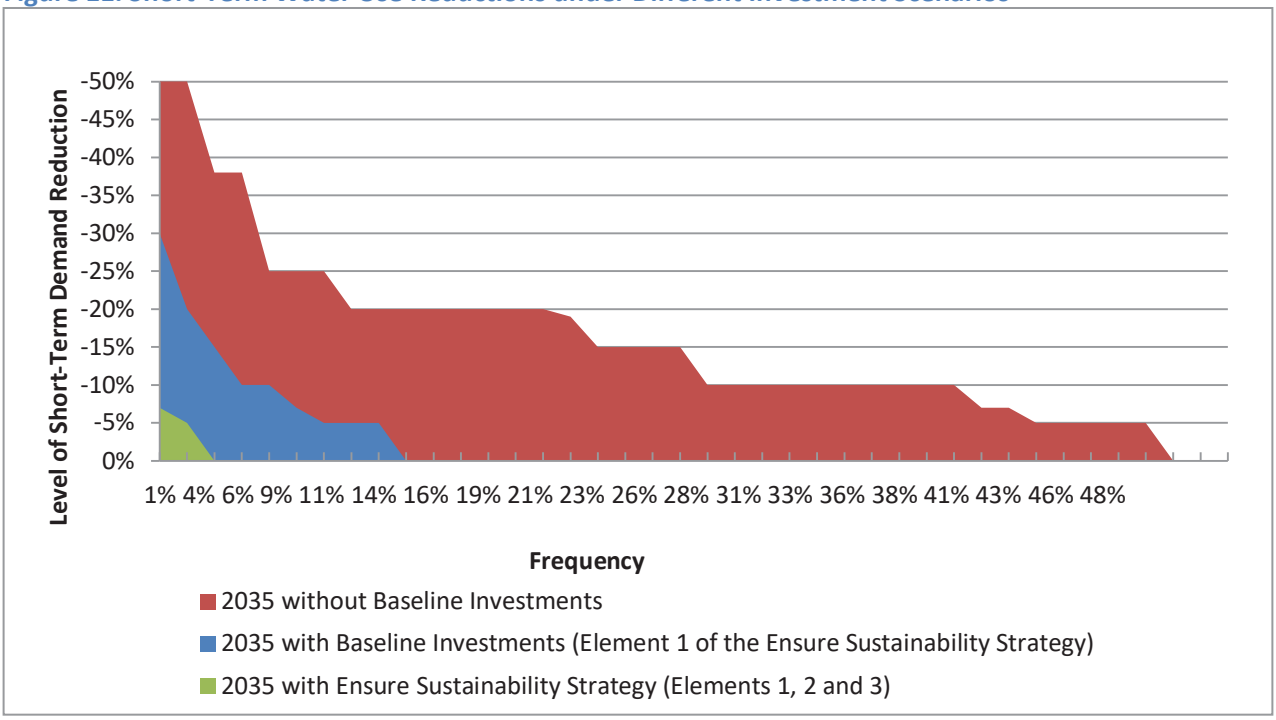
Figure 10. Comparison of Drought Supplies with and without the Ensure Sustainability Strategy



Implementation of the Ensure Sustainability water supply strategy would reduce the frequency and magnitude of short-term water use reductions under 2035 demands. Figure 11 shows shortages with different investment strategies. The small green area in Figure 11 shows that, will full implementation of all elements of the water supply strategy, short-term water use reduction would occur only two percent of the time and the level of short-term water use reductions would be less than 10 percent. If

only baseline investments are made consistent with Element 1 of the Ensure Sustainability Strategy, which is illustrated by the blue area in Figure 11, the model predicts that water use reductions would occur more often and the level of short-term water reduction could be as high as 30 percent. Water use reductions this high would necessitate water use restrictions and impact the local economy. Finally, the red area in Figure 11 shows short-term water use reductions without investments in the baseline system. Water use reductions would be needed almost half the time and in some years water supply would only be available to meet health and safety needs. This scenario does not take into account likely additional imported water reductions that would occur if investments are not made in restoring the Delta ecosystem and reliable Delta conveyance, in which case there is a risk that greater water use reductions would be needed.

Figure 11. Short-Term Water Use Reductions under Different Investment Scenarios



The Water Supply Strategy Supports Other Important Public Benefits

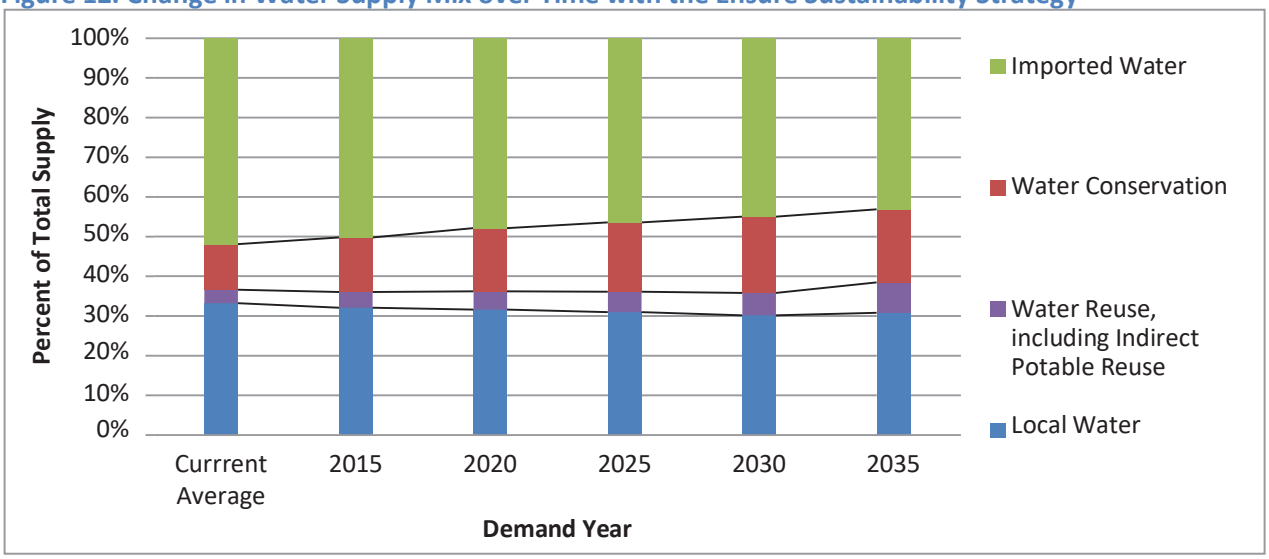
The key benefit of the Ensure Sustainability strategy is that it develops a new local drought-proof supply to achieve the District's strategy to develop supplies to meet at least 90 percent of demands during drought years, but the strategy provides other benefits too. Some of these benefits are mentioned above, including helping to maintain reservoir supplies that are used to meet flow and temperature requirements for fish in local creeks, reducing discharges to South San Francisco Bay, and improving groundwater quality. The strategy builds on existing agreements with City of San Jose and South Bay Water Recycling by developing indirect potable reuse. The additional groundwater recharge ponds

component of the strategy provides additional capacity to process wet-weather flows and help maintain groundwater levels, both of which help manage risks due to climate change and supply interruptions.

The Ensure Sustainability strategy includes imported water reoperations, which provides the benefit of maximizing the economic value of existing assets (imported water contracts and investment in the Semitropic Groundwater Bank) and helping fund investments into infrastructure and additional local supplies. Indirect potable reuse provides supply in every year, while the District's future shortages are primarily in extended droughts. Reoperations would also help create sufficient space in the Semitropic Groundwater Bank for carryover of supplies during wetter years.

Another important benefit of the Ensure Sustainability strategy is that it would reduce reliance on imported water supplies and increase water use efficiency, consistent with State policy to reduce reliance on imported water supplies for meeting future water demands. With the strategy in place, water use efficiency would increase from about 15 percent to about 26 percent. Figure 12 illustrates how the mix of countywide supplies and long-term conservation savings would change between now and 2035.

Figure 12. Change in Water Supply Mix over Time with the Ensure Sustainability Strategy



The Ensure Sustainability Strategy is Consistent with Stakeholder Input

The water supply strategy incorporates stakeholder input. The Stakeholder Review Committee (SRC) provided input and feedback on key Water Master Plan decisions and approaches throughout the planning process and concurred with the strategy. District Board Advisory Committees had opportunities to provide input during the Water Master Plan process. Staff also made presentations to the Water Retailers Committee, Water Retailer Subcommittees, and other agencies and organizations.

Stakeholders provided the following input on the Water Master Plan strategy and other water supply options:

- Maintain water supply reliability,
- Plan for population increases and climate change,
- Continue an aggressive level of water conservation programs,
- Evaluate regional recycled water projects,
- Consider indirect potable reuse projects and pursue direct potable reuse,
- Be aware of concerns about local reservoir expansion,
- Investigate regional projects such as the Regional Desalination Project or Los Vaqueros Reservoir Expansion that may provide dry-year options, and
- Address concerns about the reliability of imported supplies conveyed through the Delta.

Other Water Supply Options Are Not Recommended At This Time

The District considered a variety of water supply options for the Water Master Plan. Water supply options that stakeholders requested be included in the Water Master Plan, but are not recommended at this time, are discussed below.

Local Reservoir Expansion

Expanding Anderson Reservoir was one of the options considered for the Water Master Plan

A number of stakeholders expressed concerns about local reservoir expansion, while a number of stakeholders saw value in the increased storage provided by reservoir expansion. Staff analysis indicated that even an expansion project that would add 100,000 AF of storage would not significantly improve the ability to provide water through an entire drought, which is the primary challenge the Water Master Plan addresses. Storage would be depleted by about the fourth year of drought. Consequently, the water supply strategy does not include reservoir expansion. However, the District will re-evaluate reservoir expansion in the future as understanding of local climate change impacts improves, or in considering broader operational and water management needs such as emergency storage.

Direct Potable Reuse

Several stakeholders expressed an interest in the District implementing a direct potable reuse project, in which advanced treated water is added to the District raw water system and can be sent directly to drinking water treatment plants. At this time, California does not allow direct potable reuse. The

California Department of Public Health (DPH) is required by law to determine the feasibility of developing regulations for direct potable reuse by December 2016.[6] The District will re-evaluate the feasibility of direct potable reuse after the DPH analysis is complete.

Regional Supply Options

The District has been participating in the Bay Area Regional Desalination Project feasibility study since 2003. The project is currently completing technical studies that will help inform different agencies' decisions regarding whether to proceed with participation in project design and construction. The Ensure Sustainability water supply strategy does not include continued participation in the Regional Desalination Project, because lower cost options such as dry-year option agreements would provide supplies with a similar level of reliability.

One stakeholder also expressed an interest in the District participating in an expansion of Los Vaqueros Reservoir, which is owned and operated by Contra Costa Water District (CCWD). CCWD recently expanded its Los Vaqueros Reservoir from 100,000 acre-feet to 160,000 acre-feet, and is continuing to explore further expansion. CCWD has characterized the 160,000 acre-foot expansion as having emergency and dry-year storage opportunities for local Bay Area agencies, but these opportunities have not yet been defined. Similar to local reservoir expansion, the usefulness of participation in Los Vaqueros in meeting multi-year drought water needs would be limited.

The District will further consider these regional projects as dry-year options if there is a mechanism for receiving the water in dry years that is independent of the conveyance through the Delta.

Rebates for Rainwater Harvesting and Other On-Site Stormwater Reuse Projects

The District supports efforts to reuse and infiltrate clean rainwater. However, offering rebates to incentivize these efforts is not currently cost-effective. For example, a large of amount of storage is required to harvest sufficient amounts of winter rainfall to meet a significant portion of summertime irrigation demands. The cost of this storage is far greater than the water savings that would be achieved. The District will continue to monitor these types of activities as potential future opportunities. The District will also continue to support low impact development policies that reduce water demands, protect water quality, and improve groundwater recharge.

Westside Intertie with the San Francisco Public Utilities Commission

The District and San Francisco Public Utilities Commission (SFPUC) currently have an emergency intertie between the two systems in Milpitas, on the east side of the District's treated water system. The intertie improves reliability for customers of both systems during outages and interruptions. In addition,

[6] California Water Code Section 13563

the District's eastside treated water system has pipeline and treatment facility redundancy. The District's westside treated water system currently lacks an intertie and redundancy. This Westside Intertie would extend the District's West Pipeline approximately 29,500 feet to connect to the SFPUC system. This project would provide capability to convey up to 50 MGD of water between the SFPUC and District systems, providing emergency back-up supply to both systems. This would also provide some redundancy for Palo Alto and other cities that rely heavily on SFPUC supplies. The estimated cost for the project ranges from about $100 million for a pipeline extension to about $250 million for paralleling the West Pipeline. Paralleling the West Pipeline would also provide some redundancy for the District's westside treated water system. This project is not recommended in the Water Master Plan because it does not contribute to long-term supply reliability. However, it will be considered during a planned Infrastructure Reliability Master Plan.

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Implementation Will Be Phased In Over Time

Implementation of the Ensure Sustainability water supply strategy would occur over the 2035 planning horizon. Planned investments in water conservation, water recycling, and the existing water supply system will provide for most of the increased water supply needed to meet future demands. This gives the District time to conduct the necessary work to support the most costly project in the water supply strategy: indirect potable reuse. Necessary work includes building the foundation of public support, researching advancements in treatment effectiveness and efficiency, and monitoring regulatory developments. This chapter contains detailed information on what activities can be undertaken to implement the Ensure Sustainability strategy. The chapter concludes with information regarding monitoring and future updates to the Water Master Plan.

Phased Implementation Will Help Ensure Efficient and Effective Investments

The implementation plan consists of five phases over the next 20 years. An overview of the plan is shown on the following page in Table 5. A summary of the implementation plan for new projects and programs is below.

- **Phase A: 2012 – 2016:** Further studies and planning for projects and programs, as well as public education, outreach, and engagement
- **Phase B: 2017 – 2021:** Project level planning for a new recharge pond and the IPR project, as well as beginning imported water reoperations and the gray water rebate program. Begin design for IPR and groundwater recharge ponds.
- **Phase C: 2022 – 2026:** Complete design and begin construction of IPR; complete design and construction of groundwater recharge ponds.
- **Phase D: 2027 – 2031:** Complete construction of IPR and begin operations.
- **Phase E: After 2031:** Operations of all new projects and programs

The District will monitor water supply conditions, update assumptions, and periodically validate this implementation plan. The Water Master Plan does not commit the District to a particular course of action. To capture changing conditions such as changes in supply and demand projections, climate, regulations, and baseline systems, the District will conduct a master plan update every five years and will adjust the strategy and implementation plan accordingly.

Table 5. Implementation Approach

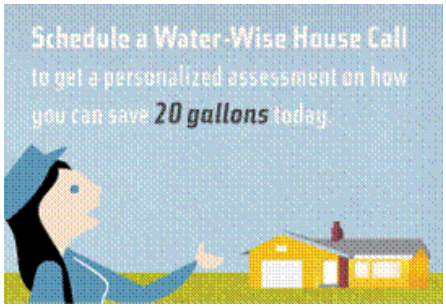
Strategy Element	Phase A: 2012 – 2016	Phase B: 2017 – 2021	Phase C: 2022 – 2026	Phase D: 2027 – 2031	Phase E: After 2031
1. Secure Existing Supplies and Infrastructure (Baseline Water Supply System)	• Participate in Recycled Water Master Plan Updates • Continue Expanding Water Conservation Savings • Bay Delta Conservation Plan Completion • Secure SFPUC supplies • Secure Dry Year Option Agreements • FAHCE Settlement Completion • Climate Change Studies • Infrastructure Reliability Master Plan	• Continue Expanding Water Conservation Savings • Secure CVP M&I Allocation Agreement beyond 2022 • Dam Seismic Retrofits Construction • Main and Madrone Pipelines Rehabilitation • Replace Vasona Pumps • Secure Dry Year Option Agreements	• Continue Expanding Water Conservation Savings • Secure Dry Year Option Agreements	• Conservation program savings of 99,000 AFY • Renew CVP Water Supply Contract • Secure Dry Year Option Agreements	• Recycled water use of approximately 30,000 AFY • Secure Dry Year Option Agreements
2. Optimize the Use of Existing Supplies and Infrastructure *Adds about 5,000 AFY of supply*	• Negotiate and obtain any necessary permit for imported water reoperations	• Groundwater recharge pond planning study and design • Lexington Pipeline planning study and design • Begin imported water reoperations	• Construct groundwater recharge ponds • Construct Lexington Pipeline • Continue imported water operations	• Begin operating new facilities • Continue imported water reoperations	• Continue operating new facilities and imported water reoperations
3. Increase Recycling and Conservation *Adds about 20,000 AFY of supply*	• Continue Public Outreach and Engagement on Recycled Water • Monitor advanced recycled water treatment effectiveness • Monitor recycled water and conservation regulations and policies • Develop groundwater protection guidelines for gray water reuse	• Continue public outreach and engagement on recycled water • Indirect potable reuse planning study • Begin gray water reuse rebate program	• Indirect potable reuse project design • Continue gray water reuse program	• Indirect potable reuse construction • Continue gray water reuse program	• Indirect potable reuse operation • Continue gray water reuse program
Estimated Cost for Baseline and New Investments, including Inflation	$1,114,000,000	$1,550,000,000	$2,097,000,000	$2,703,000,000	$3,416,000,000

1. Secure Existing Supplies and Infrastructure

This section describes how the Secure Existing Supplies and Infrastructure strategic element will be implemented over time. Information is present on securing planned water conservation savings, planned recycled water expansions, local water supplies, imported water supplies, infrastructure improvements, and special studies.

Water Conservation

Most of the water conservation program in the next 20 years is related to continuing current and planned programs to reach the goal of about 99,000 AF of water conserved per year by 2030. It will be challenging to meet the current 2030 target for water conservation, as the District has already implemented many basic conservation programs including programs to reduce residential, commercial and industrial, and landscape water use. However, continued investments in expanding water conservations savings are critical to managing demands and providing a reliable supply of water.



Water-Wise House Calls is one of the District's many programs that help increase water conservation savings.

Recycled Water Activities

Non-potable recycled water use is projected to expand from about 15,000 AFY to 29,000 AFY by 2035. Currently, the recycled water producers and retailers in northern Santa Clara County are updating their recycled water master plans. In Phase A (2012 – 2016), the District will focus on participating in these master planning efforts, and postpone any further capital investments in recycled water until master plans are completed. Specific tasks related to recycled water master planning include:

- Partner in the development of a Recycled Water Master Plan for the South Bay Water Recycling (SBWR) system.
- Postpone investment in the Regional Recycled Water Connector project until the SBWR Recycled Water Master Plan is completed.
- Monitor and participate in Recycled Water Master Plans for the Palo Alto and Sunnyvale systems.
- Evaluate the need for a regional master plan after the SBWR, Palo Alto, and Sunnyvale master planning efforts are complete.
- Align District recycled water program goals with SBWR, Palo Alto, Sunnyvale, and South County Recycled Water Master Plans, or with a regional master plan.

Expanding non-potable systems is not without risks. A primary concern is that expansion of non-potable use could have negative impacts on groundwater quality. Continuing technical studies on the effects of irrigation with recycled water, and completing the Salt and Nutrient Management Plans for north and

south county groundwater subbasins will help address this risk. Blending advanced treated recycled water also helps address this risk, and will become increasingly important as non-potable use is expanded. Another risk of expanding non-potable use is that assets may become stranded. As locations of recycled water use change, pipes to those areas may become obsolete. Recycled water master planning will help mitigate this risk.

This pipeline in Gilroy provides recycled water to a local farmer

The District will continue to look for opportunities for additional stormwater recharge throughout the planning horizon. The State's Recycled Water Policy requires that Salt and Nutrient Management Plans include stormwater recharge goals and objectives. The District already recharges about 50,000 AFY of stormwater through existing recharge facilities. The District will continue to look for opportunities for additional stormwater recharge as part of developing groundwater recharge capacity and planning flood protection projects. These types of projects could help optimize local supplies.

Local Supplies

Since 1996, the District has been working to address a legal challenge to its water rights in the Stevens Creek, Guadalupe River and Coyote Creek watersheds. Before the challenge can be resolved, the District must prepare a Habitat Conservation Plan (HCP) covering all three watersheds to provide incidental take coverage for all the activities included in the draft settlement agreement developed through the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE). When implemented, and the necessary environmental reviews conducted, the plan will improve local fisheries and serve as the basis for dismissal of the water rights challenge. The District will continue work to ensure the FAHCE settlement agreement is implemented, thereby providing assurances that its water rights are protected from future challenges. The District expects to begin implementation of the FAHCE settlement agreement in the next five years.

Imported Water

Maintaining the availability and reliability of the county's imported supplies is a critical element of the water supply strategy. The District's state and federal imported water supplies, water banking in the Central Valley, and water transfer agreements all rely on conveyance of water through the Delta. The District is well aware of risks associated with Delta water including potential catastrophic levee failures and more stringent endangered species regulations. Other imported water risks include an interruption of SFPUC supplies to the cities of San Jose and Santa Clara and a loss of reliability in the District's CVP M&I water supplies.

Recommended actions to address these risks and secure baseline imported water supplies include participation in developing the Bay Delta Conservation Plan (BDCP), securing SFPUC supplies to the county, and supporting an acceptable CVP M&I water reliability policy.

Almost 40 percent of the District's current water supply is conveyed through the Delta

District participation in the BDCP is expected to continue through the first phase of Water Master Plan implementation, depending on the outcome of permitting decisions that will be made in summer 2013. Securing SFPUC supplies to the county will also occur in the first phase of implementation, as SFPUC decisions about its contract with the cities of Santa Clara and San Jose are scheduled to be made by 2018. The District will work with water retailers to supply guarantees from SFPUC.

The Bureau of Reclamation is expected to complete environmental documentation and finalize its CVP M&I water shortage policy in the first phase of implementation, and the District will continue to implement its supporting supplemental agreement with CVP agricultural districts. This agreement is valid through 2022, and any needed work to extend it does not need to occur until the second phase of implementation.

The District currently uses various imported water options to supplement supplies during water shortages. The Water Master Plan includes securing such dry-year supplies, though dry-year option agreements. The amount of water secured in the option agreements increases from 6,000 acre-feet per year (AFY) in phase two, to 15,000 AFY in phase three, to 23,000 AFY in the beginning of phase four. Once indirect potable reuse supplies are available in phase four, the option agreement amount decreases to 12,000 AFY.

Infrastructure

The Water Master Plan assumes the District will make investments to repair and improve its existing dams, so that the reservoirs can be operated at full capacity. The District needs to maintain all its local storage capacity. The District will continue to make seismic improvements to its dams including Anderson, Calero, Guadalupe, and Almaden. Dam seismic upgrades will not be completed until the end of phase two, as some dams are still being studied to determine if retrofits are needed, and seismic retrofits take many years to complete. The District's FY 2013-17 Capital Improvement Program includes about $327 million for improvements at Anderson, Calero, Guadalupe, and Almaden dam. Additional investments may be needed to address seismic concerns at other dams that have not yet been studied completely.

The Main and Madrone pipelines are currently not being used to their design capacity but are needed for future supply reliability in the Llagas groundwater subbasin. The Water Master Plan assumes these two pipelines will be restored to full capacity. Without the pipelines restored, projected future shortfalls would be more severe. Restoration of the Madrone pipeline is more urgent, as it is not meeting current service requirements. The restoration of the Main and Madrone pipelines will be completed by the end of phase two. Project planning and design should incorporate additional capacity in the pipelines (approximately five cubic feet per second) to accommodate potential future needs to increase groundwater recharge in the Morgan Hill area. The estimated capital cost of restoring the pipelines is about $8 million.

Pipelines and other infrastructure need periodic rehabilitation and replacement

The Vasona pumps need to be replaced, as they are approaching the end of their life-cycle. Based on the capacity analysis performed as part of the Water Master Plan, existing pump station capacity is adequate for typical operations now and with full implementation of the Water Master Plan. However, upsizing the pumps would add increased operational flexibility. The Water Master Plan recommends designing the pump station upgrades to include the ability to add additional pumping capacity in the future. The preliminary capital cost estimate for Vasona Pump Station updates is about $5 million.

Special Studies

The Water Master Plan analyzed the District's vulnerabilities to climate change and presents the Ensure Sustainability strategy that adapts to those vulnerabilities. However, the District currently has insufficient data for estimating climate change effects on local water supplies. In order to better analyze climate change impacts in future Water Master Plan updates, the District will gather additional data on temperature, precipitation, and water use and analyze the data for correlations and trends. This information will be used to help forecast local climate change impacts. Climate change studies will be completed in Phase A, so that quantitative estimates can be included in the analysis for the next Water Master Plan update.

The District's Water Utility needs a comprehensive Infrastructure Reliability Master Plan to ensure a reliable water supply infrastructure system is available for current and future use. The Water Master Plan evaluated the need for new and upgraded infrastructure to transport, treat, and store current and future water supply sources. However, the Water Master Plan focus was on long-term term water supply planning and developing the District's overall water supply strategy. The District's Water Infrastructure Reliability Project (IRP) was completed in 2005 and identifies operational and capital

improvements needed for post-disaster reliability. Most of the identified improvements are being implemented, though the need for some elements (well fields) has changed. The District's Asset Management Program helps identify infrastructure renewals and replacements. Currently the program is focused on identifying renewals and replacements due to age or poor condition. A comprehensive Infrastructure Reliability Master Plan will address the reliability of the whole infrastructure system, analyze multiple modes of failure (mortality due to age or disaster, capacity, level of service) and address short-term service outages. The plan would identify projects and programs to ensure a secure and reliable infrastructure system.

Additional well fields, like the one housed in this building in Campbell, may be one approach to improving infrastructure reliability.

2. Optimize the Use of Existing Supplies and Infrastructure

This section describes how imported water reoperations, the reservoir pipeline, and new groundwater recharge ponds will be implemented to optimize the use of existing supplies and infrastructure.

The water supply strategy includes imported water reoperations to sell or exchange up to 50,000 AFY of imported water when Semitropic Groundwater Bank storage levels are nearly full and District water supply needs are otherwise met. In Phase A of implementation, the District will identify potential water transfer and exchange partners, and develop necessary agreements and approvals.

The water supply strategy adds new infrastructure to the water supply system – the Lexington Reservoir Pipeline and additional groundwater recharge ponds. The Lexington Pipeline will be constructed concurrently with the IPR facilities, with planning beginning in Phase B. The pipeline will allow continued utilization of existing local water rights once the indirect potable reuse project is in place. The strategy also includes construction of new recharge ponds near Saratoga Creek. Project-level planning and design for the new ponds will begin in Phase B, and construction will occur in Phase C.

3. Increase Recycling and Conservation

This section describes how increases in water use efficiency, beyond those included in the baseline water supply system, will be implemented as part of the Ensure Sustainability Strategy.

Indirect Potable Reuse

The first phase of implementation (Phase A) for indirect potable reuse consists of continued stakeholder engagement, further study and testing of advanced treated water quality, monitoring state regulations regarding indirect and direct potable reuse, and confirming maximum brine and minimum fresh water

flows that are necessary to support a healthy Bay ecosystem. The District will soon complete construction of the Silicon Valley Advanced Water Purification Center, an advanced water treatment facility that will produce up to 8 million gallons per day of highly purified recycled water. The District will use this facility to monitor and test treatment effectiveness for the proposed indirect potable reuse system. The Center will also serve as a center-piece to gain public support for use of advanced treated water in the water supply system.

Reverse osmosis treatment is one step in the purification process that makes recycled water suitable for potable purposes

The next master plan update (2016) will validate the project before making any large capital investment. Phase B through Phase E of implementation for IPR include project level planning, design, construction and operations, respectively.

One of the major risks associated with investing in indirect potable reuse is public perception. Fostering public acceptance is critical to the success of the indirect potable reuse project. Another risk is the potential for stranded assets. As purification technologies improve and more testing is completed, regulations may change to allow for direct potable reuse. If this occurs, pipelines from wastewater treatment plants to the ponds could become stranded assets. The extended implementation period helps to address these risks.

Water Conservation

The Ensure Sustainability strategy adds one new water conservation program: gray water reuse. In the first phase of implementation, the District will develop groundwater protection guidelines and program details. Groundwater protection guidelines will address concerns with the quality of the gray water potentially being returned to the aquifer. This rebate program will begin in about 2017, during Phase B.

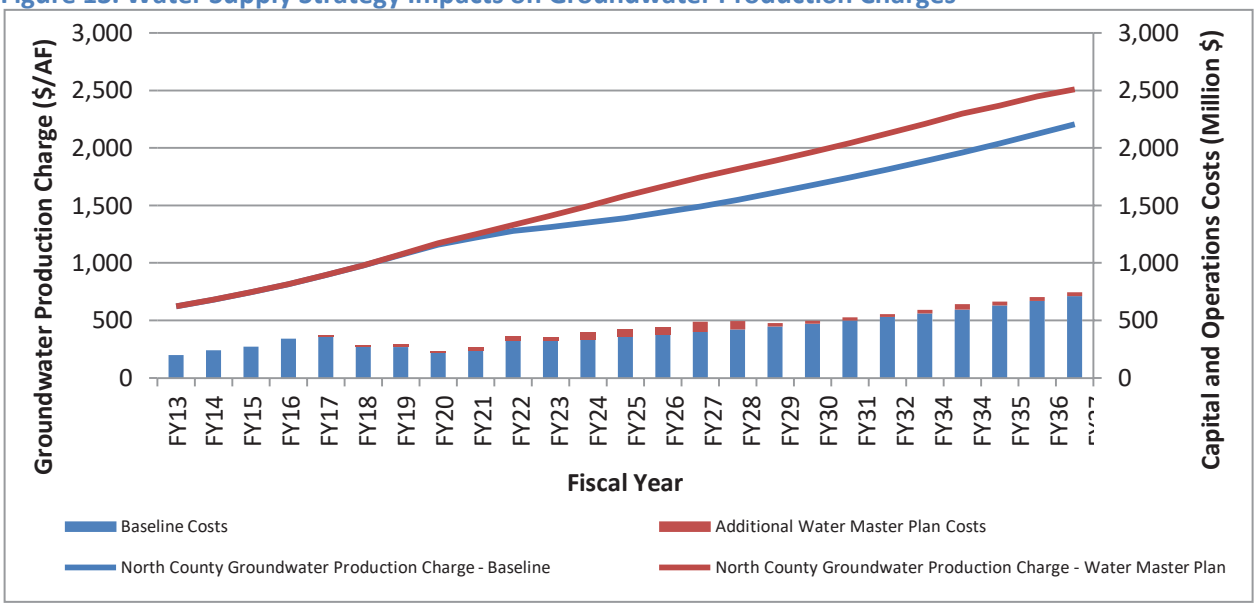
Conservation is dynamic with new technologies being developed, new implementation methods being tested, and associated costs declining. The District will continue to monitor technology and policy developments that may create new opportunities for increased conservation. The District will also to encourage land use agency efforts to implement low-impact development and monitor opportunities to increase conservation through land use policy. Developments in either of these areas may result in new conservation activities becoming feasible for future Water Master Plan updates.

Water Supply Costs Will Also Be Phased

Stakeholders value water supply reliability and most are willing to pay for it. The Stakeholder Review Committee was almost unanimous in their support of the Ensure Sustainability water supply strategy, even though it costs much more than other water supply options. The economic analysis found that the benefits of the water supply strategy are more than double the costs. The present value cost of the water supply strategy, excluding securing the baseline water supply system, is about $440 million. This does not include a potential present value benefit of about $70 million from imported water reoperations. The estimated impacts on groundwater production charges in Zone W-2 in northern Santa Clara County range from no incremental change up to a peak increase of about $335/AF in 2034. By that time, the groundwater production charge for the baseline water supply system is projected to be about $1,960/AF, based on the District's future investments that are necessary to maintain the baseline water supply system. The Ensure Sustainability strategy, as laid out in this plan, will have minimal effects on groundwater production charges in Zone W-5 in southern Santa Clara County, because most of the new investments benefit Zone W-2. Figure 13 shows the anticipated impacts of the water supply strategy on groundwater production charges in Zone W-2 (North County).

"I would rather answer calls about water rate increases than have to tell someone I can't deliver water to them." – Stakeholder Review Committee Member

Figure 13. Water Supply Strategy Impacts on Groundwater Production Charges



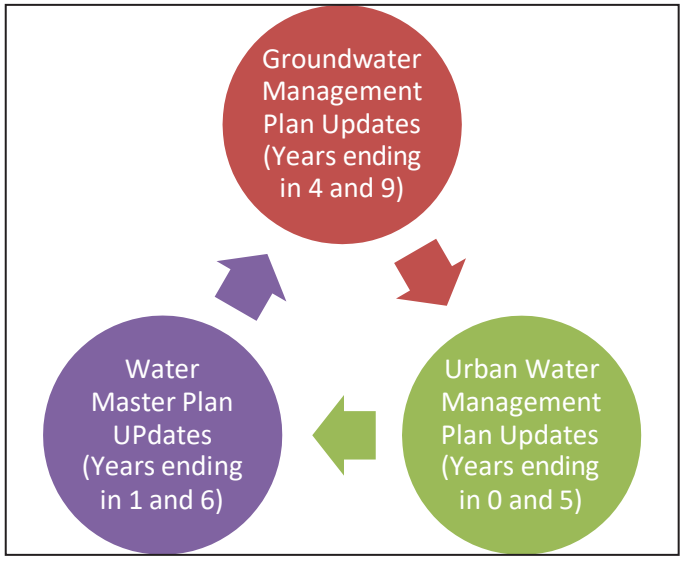
The District may be able to reduce costs for the water supply strategy if the following opportunities become available in the future:

- Direct potable reuse is permitted and accepted by the community and regulatory agencies;
- Advanced treatment technologies become less expensive, more efficient, or both; and
- Partners are willing to enter into imported water exchange agreements.

The Water Master Plan Will Be Monitored and Updated

The Water Master Plan recognizes that baseline supplies and infrastructure are subject to change. Therefore, the long-term strategy will be updated every five years following preparation of the Urban Water Management Plan to capture updated supply and demand projections, as well as changes in groundwater basin management objectives. This water management planning cycle is illustrated in Figure 14. The implementation plan will be reviewed annually over the next five years to ensure that the recommendations are still valid, and to ensure that all Water Master Plan projects and programs are budgeted, planned, and completed at the appropriate times. The District will report on progress annually, and will measure success using performance measures and milestones.

Figure 14. Water Resources Planning Cycle



The Water Master Plan recognizes that completion of baseline projects and programs such as the BDCP and FAHCE implementation, and many other circumstances such as water reuse regulations, can significantly affect the Water Master Plan strategy. Additionally, new issues will likely arise over the planning horizon. The plan will be updated every five years to address any changed and new circumstances. Periodic plan updates will allow the District to address any new or changed circumstances and to adjust its water supply strategy to fit the needs of the county in the future.

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